

Water Energy Nexus Operational Toolkit: Renewable Energy

The CHRICHIRA Hydropower project Tunisia SONEDE

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Tunisia the SONEDE

- The National Society of Water Exploitation and Distribution (SONEDE): created on 02 July 1968.
- Its mission covers three main activities:
- production of water: production, treatment and transport.
- water distribution: management and maintenance of the network, management of customers.
- • development: surveys, works and supplies.

WATER RESOURCES IN TUNISIA

Total water resources: 4.6 billion m³ / year

- 41%: groundwater - 59%: surface water

- Water stress: 430 m³ / year / inhabitant: Limited resources.

The use of water in Tunisia is divided as follows:

- 83% of the resources used are for agriculture.
- 17% of the resources used are for drinking water. –
- Only 52% of water resources have a salinity of less than 1.5 g / l: Relatively high salinity - 86% of good quality resources are located in the north of the country:
- Great regional disparity

Strategy and Objectives for SONEDE

Mitigate the imbalance in the distribution of resources
Meet the water needs of all water users
in the required quantity and quality

To realize this strategy,
SONEDE has used several means, mainly :

Transfer over long distances

Use of unconventional resources:
Desalination of brackish waters

Development of a large infrastructure for the production and
transfer of water

High Energy consumption at SONEDE

The production transfer and distribution of water through the complex and diverse hydraulic infrastructure of SONEDE, requires high energy consumption, which places SONEDE as one of the largest consumers of energy in Tunisia.

ENERGY MANAGEMENT ACTIONS (1997 - 2014)

For many years SONEDE has carried out many actions aimed at controlling energy costs :

- the judicious choice of electricity pricing
- and optimization of pumping according to the prices of the hourly electricity stations,

Many actions aimed at controlling energy costs

For many years SONEDE has carried out **optimization of pumping**

according to the prices of the hourly electricity stations,
the strengthening of energy diagnosis,
acquisition of increasingly efficient equipment energy component

improving the energy performance
of several pumping and desalination plants

Acquisition of energy diagnostic equipment
(thermographic cameras, vibration analyzers, energy analyzers,
ultrasonic flow meters, differential pressure meters, etc.)

Introduction of Renewable Energy and Energy Management

Construction of the **largest photovoltaic power plant in Tunisia (212 kWp) at the Ben Guerden desalination plant** (inaugurated in June

Energy audits of energy-intensive pumping stations

Optimization of the choice of electricity contracts.

Reduction of power subscribed to peak electricity.

Optimization of pumping times according to electricity rates

This program has been applied for the 1300 stations of SONEDE

SONEDE ENERGY MANAGEMENT PLAN 2015-3030

Renewable Energy Floating photovoltaic generators

SONEDE explores the possibility of creating photovoltaic generators installed on floating platforms on the water reservoirs

This concept has the following advantages :

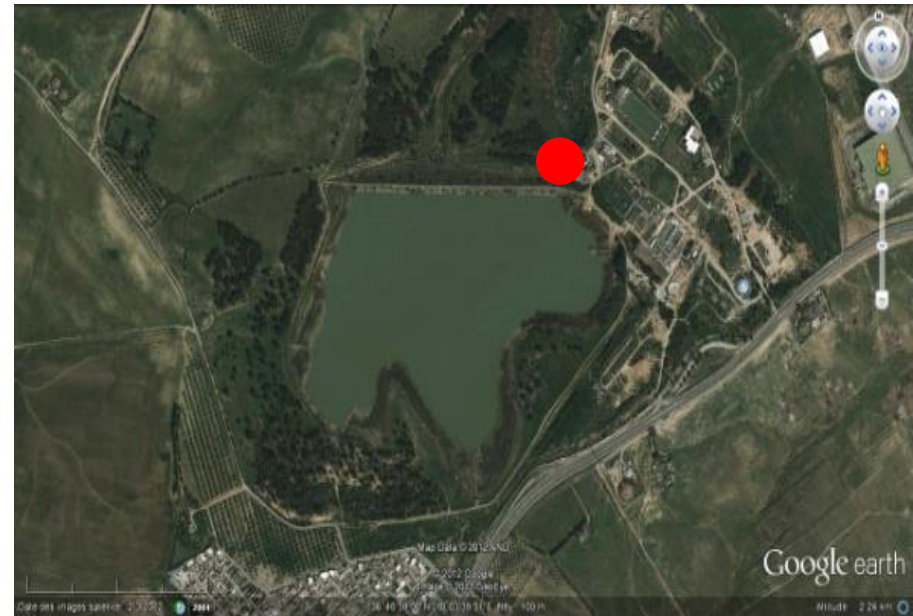
Avoid occupying useful land Optimize the integration of photovoltaic production by bringing it closer to major SONEDE stations

example: Ghdir el Golla reservoir in Greater Tunis).

Have significant potential for cooling photovoltaic cells

Tracking the sun with a less expensive and more robust system

Feasibility study in progress: Floating platform of 1MW in Ghdir el Golla (GRAND TUNIS)



SONEDE ENERGY MANAGEMENT PLAN 2015-2030

Hydroelectricity on Drinking Water Pipes

Oued el kebir Dam

1925 Francis Turbine (SONEDE)



Hydroelectricity history on the Sidi Jedidi reservoir

1953 Francis Turbine (SONEDE)



Fernana upstream and downstream power stations

Kasseb dam: 1969

Francis turbine (STEG)



Renewable Energy

Hydroelectricity on Water Pipes



A clean renewable energy using the power of water to produce electricity.

A Pilot action for SONEDE in the framework of cooperation with ESCWA:

Identification of a hydroelectric potential at the Chrichira adduction (1,3GWh / year)

The technical and economic feasibility study of the 200 kW micro-hydroelectric plant will be carried out within the framework of the cooperation with ESCWA.

Proposal for Tunisia Technical feasibility study of micro-hydro system for SONEDE

- installing a turbine on a water transmission network to generate electricity.
- assess the technical feasibility of a proposed micro-hydro installation on a water transmission line with elevation differences
- provide technical specifications in order for SONEDE to tender this project.
- Detailed technical feasibility study of micro-hydro system
- including site visit, data collection, meetings, etc

Reducing the energy consumption of the hydraulic system at CHRICHIRA

- This project consists of studying the possibility of reducing the energy consumption of the hydraulic system of the "Kairouanais" network (Chrichira system)
- by modifying the existing network and installing a hydroelectric micro-turbine to produce electrical energy.

Morocco the Toubkal microhydro Plant

- A French association in Morocco, managing a chalet and 4 mountain huts
- The Toubkal hut : An ecological showcase in high mountains
- 350 beds, open all year through
- Protection of nature and the environment
- The waterfall of a neighboring stream
- Using a 60 meters difference in height.
- water flow between 50 l/s and 3 l/s, all year round
- A pressure water pipeline, 350 meters long, 110 mm diameter in PVC

Toubkal technical Characteristics

- Using a 60 meters difference in height.
- water flow between 50 l/s and 3 l/s, all year round
- A pressure water pipeline, 350 meters long, 110 mm diameter in PVC
- Pelton Turbine of 5 KW Constructor : IEM AC4/38
- 450 kg equipment, carried on mule back, up 1500 meters
- Cost 30 000 Euros with civil engineering



The Toubkal Mountain hut

Small Hydro in Morocco

The Toubkal Micro hydro plant at 3207 m





Morocco

The Assif Ait Mizane stream

Complete survey and construction of the hydropower microturbine of the Toubkal mountain, as President of the “Club Alpin Français de Casablanca”



IREM turbine

Installation by TEP, Grenoble

**Cameraman
of Moroccan
TV
Dounya**

**Pelton
Turbine
5 KW**



Chrichira Project Outcome

- Provide technical specifications for turn key contract, ready to include in a tender document
- Project brief to highlight this pilot project to other Arab countries and lessons learned
- To encourage other countries to look into this technology
- within the water-energy nexus context

Thank you for your attention

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